DOCUMENT RESUME

ED 056 694 LI 003 202

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|---|---|
| TITLE | Library Work and Automation; A Summary of the Swedish Report "Biblioteksarbete och Automatisk Databehandling." |
| INSTITUTION | Royal Library, Stockholm (Sweden). |
| PUB DATE | 70 |
| NOTE | 22p.; (0 References) |
| EDRS PRICE | MF-$0.65 HC-$3.29 |
| DESCRIPTORS | *Cataloging; Computer Programs; *Electronic Data Processing; *Foreign Countries; *Library Automation; Library Networks; Models; National Libraries; *On Line Systems; Research Libraries |
| IDENTIFIERS | Machine Readable Cataloging; MARC; *Sweden |

ABSTRACT

The work of the Committee on the use of automation in Swedish research libraries has differed from that of a normal study group by virtue of its heavy concentration on the practical aspects of library catalog work, the present status of which is the main theme of this report. The model presented implies total and simultaneous integration of all Swedish research libraries, a national model which to date has no counterpart elsewhere. A key feature of the project is the catalog scheme based on the MARC systems, which ensures the compatibility of the Swedish model with international systems. For purposes of method development, operation of the proposed data processing center and training of the necessary qualified personnel, the Committee recommends that an independent institution for data processing in libraries be set up on the West German model. (Author/NH)

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# LIBRARY WORK AND AUTOMATION

Stockholm, Royal Library 1970

LI 003 202

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# Library Work

# and Automation

a Summary

of the Swedish Report

Biblioteksarbete och automatisk Databehandling

Stockholm

Royal Library

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In collaboration with the Director of the Royal Library, the Office of the Chancellor of the Swedish Universities appointed a committee on the use of automation in Swedish research libraries which in June 1969 submitted a report entitled Biblioteksarbete och automatisk databehandling. A summary of the report is presented here.

It should be mentioned that the work of the committee is being continued by the Swedish Administration Development Agency, the object being to integrate different library routines with the aid of advanced automation technology based on on line-systems and direct-access memories. The result will be published as it becomes available.

## Terms of reference and activities of the Committee

The Committee was convened on 8 July 1964 by the Office of the Chancellor of the Swedish Universities to study questions concerned with the use of mechanical aids in scientific library services. In October 1965 it assumed the name "Committee on ADP in Research Libraries".

After experiments with an ADP-generated trial series, AKN-B, which listed new accessions to six major Swedish research libraries, regular lists of new books (AKN-Hum and AKN-Nat) together with an index series have been published since September 1967, and the system has been developed for production of the Accession Catalogue (AK) by ADP throughout. The American and British MARC projects have been closely studied in this connection. These practical innovations and the possibilities of future integration of library routines by ADP are the principal subjects of the present report. The Committee has not dealt in detail with mechanised documentation and IR work (in a restricted sense), but is of the opinion that it will be necessary to solve the technical problems of systematic co-ordination between these fields and ordinary bibliographical work.

## Brief review of ADP in libraries in recent years, especially outside Sweden

The period since 1965 has been characterised by rapid and intensified development of ADP in the international world of research libraries. This has been made possible by technical improvements in both equipment and methods in the form of faster computers, larger direct-access memories, on-line scanning methods with the help of advanced terminal equipment, etc.,and by the growth of understanding and interest that the experiments and in-depth organisational analysis of library work in the pioneering years have brought about.

The USA still occupies a leading position with regard to developments in this field. Central library bodies such as the Council on Library Resources generously support both local and central projects. Comprehensive planning characterises such projects as those being carried on at the University of California and the Washington University Medical School as well as the advanced experiments in on-line methods being conducted at the University of Chicago Library. Most interesting of all in this field is the work being done at the Library of Congress, which is discussed at the conclusion of this summary.

ADP procedures were introduced at an early stage in library work in West Germany, where above all the projects at the new University Library in Bochum, initiated in 1963, several years before the library actually opened, aimed at total integration of services and led by the Head Librarian Mr. G. Pflug, aroused international interest and admiration.

Experience from the Bochum projects has been utilised in connection with the introduction of ADP methods, especially for cataloguing work, in several newly established university libraries in West Germany, and is also being successfully applied to the production of the West German national bibliography, the Deutsche Bibliographie, by the Deutsche Bibliothek in Frankfurt-am-Main. Initiative and financial support from an ad hoc subcommittee of the Deutsche Forschungsgemeinschaft have been of great importance to the adoption of ADP in West German libraries, and for some years there has been a project to set up a special institute for ADP associated with the library services but independent of routine library work and with a staff of its own.

In recent years ADP methods have been introduced into library work in other lands besides the two pioneer countries in the field, viz. the United States of America and the Federal Republic of Germany. A prominent place is now occupied by the United Kingdom where in addition to a number of local projects the planning by the British Museum and the British National Bibliography is the primary focus of interest. One object of this planning is automation of the BNB. Other countries too can point to local or national projects of varying scope, for example South Africa and the Scandinavian countries.

International work on the application of ADP to library routines presents a fragmented picture of divergent aims, levels of ambition and methods. Experience has shown that many projects aiming at total integration of the various procedures in a library have often failed due to the complicated nature of library work and the difficulty of transposing older working methods to a new mechanised system, whereas ADP methods have been successfully applied to more limited objectives, although the difficulty of co-ordinating different automated routines has been appreciable. The solution to this dilemma must be to tackle clearly defined central areas of work, always with integration as the ultimate goal, and gradually expand into other areas, though it must be recognised from the outset that successive modifications will be

necessary. To achieve these results there is an obvious need for thoroughgoing organisational and system analyses of library duties, both on a higher level, where the picture as a whole and the ultimate aims are studied and assessed, and on lower levels where individual routines and methods are defined and tested. The special nature of library work, with its multitude of systematised working rules and repetitive operations performed on large volumes of data give it a unique organisational structure unparallelled in other fields. The need for an analysis of this work on business management lines and for introduction of ADP methods into library services is clearly recognised all over the world; the fact that the special and complicated nature of library services calls for specially adapted mechanised systems and techniques as well as specially trained personnel has become clearly apparent in the course of the experiments undertaken in past years. Lack of appreciation of these circumstances must bear the blame for many unsuccessful attempts to apply ADP to library work.

The compilation of catalogues and the associated field of bibliography have emerged more and more clearly as the central routine which ought to be the prime candidate for adaptation to ADP methods in library work. The fundamentals of cataloguing are also basic to most other library routines such as acquisition, review of periodicals, borrowing, etc. and thus constitute a foundation for future integration in local libraries as well as for national and international collaboration in the fields of cataloguing and bibliography. This latter field has its focal point in the Library of Congress, whose leading position in librarianship and bibliography has become more and more firmly established.

The two projects at the Library of Congress that have attracted most attention in this respect are the Shared Cataloging Program and the Machine Readable Catalog (MARC). The former project aims at the compilation of a central catalogue of all foreign literature relevant to American research and education, and may thus be regarded as a bibliographical project of world-wide scope. The MARC project, started in 1966, was designed to test the possibility of central compilation of machine-readable cataloguing data and of using such data in individual libraries. The success of the experiment resulted in the project, in a revised form (MARC II), being made permanent, and since 1969 it has been possible to subscribetto magnetic tapes produced by the project, although for the time being these only contain catalogue information on English-language books. Work is now in progress with the

object of extending the system to handle bibliographical descriptions of periodicals, serials, maps and musical scores in all languages. The system has been emulated in the United Kingdom, where the BNB has started a UK MARC project to automate the National Bibliography and provide a MARC tape distribution service to British libraries. This project is receiving generous support from the national Office of Scientific and Technical Information (OSTI).

The American and British MARC projects thus open the way to a global intercommunication and interchange of machine-readable catalogue compilations from the bibliographical centre of each country to corresponding centres in other countries and thence to a large number of national users; this will avoid time-consuming duplication and make a global bibliographical system feasible. Great interest in these projects has also been evident in West Germany, the Scandinavian countries and elsewhere. Such a development will however be conditional upon universal acceptance of the data heads used in the MARC projects and the introduction of uniform or at least compatible cataloguing rules and classification systems. Another important requirement is an international system of identification codes, e.g. standard book numbers on the British model and CODEN for periodicals.

A summary of international experience concerning some of the factors of importance to the successful adaptation of ADP techniques to library work can be given briefly as follows:

1. The special and complicated nature of library work must be clearly recognised, and systematic analyses must be made to define both long-term goals and individual routines.
2. Computer systems and ADP methods adapted to the special nature of the work must be developed.
3. Personnel must be trained at all levels for system analysis, system development and the programming and operation of ADP systems for library work. The persons concerned may be drawn from either the library or ADP fields, but will need supplementary training in the other field.
4. Planning and system design must be extremely thorough, and plenty of time must be allowed in the schedules for completion of projects.
5. Work at the experimental and design stages often proves to be very expensive, but the costs involved are a very sound investment

in the long run. The work of development cannot normally be financed by individual libraries or bibliographical centres, but has to be subsidised by national or private institutions and foundations, e.g. the Council on Library Resources, the OSTI and the Deutsche Forschungsgemeinschaft already referred to.

## Present method of compiling the Swedish Accession Catalogue

In order to spread information concerning newly acquired literature, most of the major scientific libraries in Sweden such as the university libraries and the Royal Library publish their own stencilled or printed accession lists in which the literature is systematically arranged in order of subjects. In addition, a joint Accession Catalogue (AK) of foreign literature acquired by Swedish research libraries has been published since 1887; the 1964 volume listed accessions to some 150 libraries. The annual volumes for 1886 to 1955 (dates refer to year of acquisition), comprising books, congress publications and periodicals, were systematically compiled in alphabetical ten-yearly registers. Beginning with the 1956 volume there have been two series, the AKB comprising books and congress publications and the AKP comprising periodicals, both with purely alphabetical listing and thus serving primarily to trace the location of the literature listed.

The Accession Catalogue is compiled by the AK editorial office of the Royal Library from reports of new accessions received in the form of catalogue cards from subscribing libraries. There is a considerable time-lag before newly reported material appears in these catalogues, partly due to staff shortage but also due to the existing system of compilation. Thus a book printed, acquired and reported in 1966 would be listed in the 1966-67 volume, which began to be compiled in 1968 and will not be published until 1970 at the earliest. This procedure inevitably involves a delay of over three years, even if adequate staff were available for the work.

The conventional compilation methods involve a large number of time-consuming steps in the form of sorting, looking up references in earlier volumes of the AK, bibliographical checks, editing, proofreading with and without manuscript, and amendment checks. The annual AKB catalogues go through three proofs, two galleys and one page proof. The five-yearly volumes are prepared by cutting and pasting entries from the annual catalogue on catalogue slips and go through one galley proof and one page proof. Proofreading represents an

especially heavy burden of work in the production of the latter volumes.

The 1964 volume of the AKB contains 776 pages and over five million characters, listing 36,000 titles and 50,000 references based on 70,000 notifications. The annual increase in the number of notifications is estimated at about 10 % - the AKP for 1956-63 comprises 30,000 titles based on 90,000 notifications.

## The AKN-B experiment (1966-67)

In the light of previous studies and interest expressed by the parties concerned, the Committee concentrated its practical efforts in the field of rationalisation by ADP to the publication of the Accession Catalogue, using a joint list of newly accessioned books to six major Swedish libraries (the university libraries, the Royal Library and the Karolinska Institute Library) as the experimental guinea-pig. The object was to experiment with a flexible body of data and its utilisation in a system for rapid production of list catalogues for various purposes, primarily a systematic (subject-grouped) presentation of the material. The system and programmes had been completed by the autumn of 1966, and a six-part experimental series entitled AKN-B was published between December 1966 and March 1967. The series included two parts containing material listed for different categories of research workers and a cumulative 3-months' catalogue, all systematically arranged.

The flexibility of the body of data is achieved by an extensive division into subheads, with for example three sorting keys and coding of relevant bibliographical information such as name of author, title, year and place of publication, designations of parts, and abbreviations. The heads are divided into seven types according to the nature of the catalogued books: one-part works or limited series catalogued by author or title, and division of continuing series into various levels (supertitles and subtitles) and parts.

The system is designed to let the computer handle as much as possible of the editing. Thus for example the body of data is edited after it has been read in, and two of the sorting keys are normally positioned by the computer. The output is edited prior to printout, and the catalogue pages are set up in two columns. Pagination, subject headings, etc. are generated automatically. The input is punched on tape according to fixed editing rules, and after the proofreading and

correcting routines the input and correction tapes are fed to the computer. After mechanical editing and alphabetical sorting, the computer produces a second proof, which is read and corrected, and after a mechanical correction routine the entries are sorted by subject groups, the catalogue pages are edited and the AKN-B masters are printed out by the computer linewriter in list form on A4(20.7 x 29.3 cm) sheets. Other lists such as errata and statistical lists are also obtained as the work proceeds. Thanks to the alphabetically sorted indices of the various parts, it is possible to produce cumulative catalogues.

The A4 masters are then photographically reduced to 75 % of their original format, offset plates are made, and the catalogues are printed. As the system is only capable of upper-case printout, this undifferentiated typography is reproduced in the catalogues. The experimental catalogues comprised more than 6,400 titles based on nearly 7,000 notifications.

The experiment was well received by librarians and research workers. The systematic listing was specially welcomed in research circles, although a desire was expressed for further subdivision of the 22 subject groups that had been used. Librarians would have liked supplementary alphabetical indices to assist in locating the literature listed. Adverse criticism was concerned mainly with the simplified typography and the lack of localisation references. All the participating libraries recommended that production of such catalogues be continued, but before this could be done the Committee had to take time to consider proposed changes, carry out modifications to the system and programmes, and study the financial aspects of the project.

The regular AKN series (1967 - )

After the experience of and views expressed on the experimental AKN-B series had been studyed and the system and programmes modified in the light of the results obtained, publication of two regular AKN series commenced in the autumn of 1967. These took the form of systematically arranged booklets. The first, designated AKN-Hum, listed books on liberal arts and social science subjects, while the second, AKN-Nat, covered natural sciences, technology and medicine. The number of participating (notifying) libraries remained unchanged at six through 1967 and 1968 and rose to seven in 1969. Publication

since 1968 has comprised eight issues a year in each systematic series, each issue listing accessions over a period of approx. 1½ months. These two series are supplemented by a joint alphabetical index series designated AKN-Hum/Nat. Index, published with the same frequency. No. 4 of each volume of the Index is a cumulative half--year index, and No. 8 is a full alphabetical list of all titles for the year.No cumulative issues of the systematic lists are published. The number of subject groups has been expanded to about 150 with headings arranged according to the SAB system, and there is scope for further additions and amendments.

The modifications to the system and data mainly had to do with the possibility of producing alphabetical indices. Cross-references from the alphabetical index entries to entries in the systematic catalogues required that the latter be furnished with reference numbers. Further, it was necessary to be able to distinguish between different items in the same entry, e.g. authors' names in different forms or, in the case of biographical literature, between the author and the subject person. Three new types of subentry were introduced: one for the reference code and two reserved for congress publications, which often have long titles requiring extra space in the index. Other improvements were made with a view to achieving greater reliability of processing and greater flexibility for identification, classification and similar purposes. The computer automatically generates reference numbers prior to printout of the systematic master lists, after which the entries in the systematic catalogues are sorted into alphabetical order. After a mechanical editing phase, the lists for the joint AKN index are printed out, each entry normally occupying one line of type. As in the systematic catalogues, the lines of the index are set up in two columns per page. Cumulative indices are produced by bulk sorting of the periodical alphabetical indices. The copy area and content of the master prints have been expanded by increasing the number of characters per line from 35 to 45 and the number of lines per column from 62 to 86. This gives about 60 % more copy per page than in the experimental AKN-B series; as the format of the printed catalogues has remained unchanged, it has been necessary to reduce the master prints to 60 % for offset printing.

The four regular monthly catalogues that appeared in 1967 contained some 10,000 different references. About 13,000 different references based on nearly 15,000 notifications appeared during the first half

of 1968; this was some 3,000 notifications below the primary target of 3,000 per month.

From the beginning of 1968 the staff and equipment resources provided for this work have comprised one full-time and two half-time punch operators, two full-time editorial and proofreading assistants and one half-time assistant, and two Friden 2302/I Flexowriter punched-tape typewriters. The Committee's systems expert is in charge of the work, and cataloguing experts from the Royal Library are available for consultation in case of doubt (e.g. with regard to classification). When the contents of a catalogue issue (Hum+Nat +Index) have been taped, it takes 10 - 15 days for computer processing and proofreading and a further 10 days or so for printing and binding. The catalogues are printed in 1,700 (Nat) to 2,000 (Index) copies; 1,000 - 1,300 of these are taken by the six libraries who contribute to the AKN, and 250 - 400 are sold to other libraries and institutions through the Library Service. The work of development has been financed by grants from the Office of the Chancellor of the Swedish Universities and the National Office for Administrative Rationalisation and Economy, while production of the AKN catalogues is paid for by contributions from the subscribing libraries, revenue from sales, and assistance from the Royal Library in the form of personnel and ~~xxxxxx~~ a grant from the AK publication vote. Computer time, printing and distribution costs for the 1968 volume are estimated at about Skr. 160,000. With the coming of the regular AKN series, the participating libraries discontinued their own lists of new accessions, and the funds thus released were contributed instead to the AKN budget.

A completely new processing system is expected to result in a radically revised form of AKN from 1971 onwards. Both the scope and the typography will be changed to permit total integration between the new accession lists and the AKB. The present AKN series are thus to be regarded not simply as a computerised and improved substitute for the accession lists of the participating libraries, but first and foremost as an experimental step on the road to a complete, systematic and more speedily produced Accession Catalogue.

## Projects for all-computerised production of the Accession Catalogue

The adoption of ADP in Swedish library catalogue work can be divided into two phases. The object of the first phase is to set up data banks of foreign research literature held and acquired by Swedish research libraries and to use these banks for rapid and economical production of all the various Accession Catalogue series (AKB, AKP, AKN), other existing joint catalogues (e.g. List Tech., List Bio-Med., etc.), and other products for which the need may arise, such as an improved SDI. The second phase will involve broadening the scope to special catalogues covering the collected works held by the research libraries. The systems adopted are to be based on the present state of the art subject to the further developments that the future will certainly bring.

A high standard of typography is essential to the proper presentation of bibliographical references in all computer-produced AK publications (the AKN and the planned AKP and AKB). Accuracy of identificatior and high-speed readability both call for a richly differentiated stock of type with regard to both size and face. Only magnetic-tape-controlled photosetting can satisfy all these requirements with regard to computerised printing, and the system designs for the definitive AK products are therefore being built up primarily around this method.

The number of different characters (not counting different sizes and faces of type) required to reproduce titles in all languages transcribed in the Roman alphabet runs to about 150, including 18 diacritics and numerous special letters. If catalogue cards, special lists and proofs are to be set up by linotype, which will presumably be cheaper than by photosetter, the linotype keyboard will have to be modified to accommodate more than the present maximum of 120 characters. A 140-character keyboard has been designed by IBM in collaboration with the Library of Congress, and the feasibility of using such a keyboard is now also being studied by the ADP Committee. A larger stock of characters and the occurrence of diacritical signs make typing much slower and consequently more expensive. For this reason the printout programme should also be designed for simpler forms of printout, e.g. without diacritics or even in upper-case lettering only, for production of simple ordering lists of various kinds.

To permit the advanced capability envisaged here, the keyboard and stock of characters of the punched-tape typewriters must be so designed that readable punch proofs can be obtained. An approach to this problem has been presented by the Committee's systems expert.

The data setup has been modelled on that used in the Library of Congress MARC II project, and is fully compatible with the latter. It is characterised by the highest possible degree of comprehensiveness and flexibility, accommodating 1,000 subheads and 10,000 positions. The subheads can in turn be subdivided into fields, and a system of field designations of various kinds (numerical codes, separator signs) provides a complete check on the bibliographical and operator elements contained in each entry and the order in which they appear.

Sorting and cross references can be derived from title data at different levels (main titles, parallel titles, subtitles, etc.), names of institutions, publishers, places of publication, languages, history (changed titles , etc.), subject characteristics, and so on. Permanently assigned reference numbers and abbreviation codes permit accurate identification for processing of requisitions, loans, etc.

The system for ADP production of the AKB aims at setting up a data bank of foreign literature in the form of books, congress publications and concluded series held by the research libraries of Sweden. The data bank is to be built up from the situation as of now; accessions previously listed in the Accession Catalogue will be retroactively included only sparingly and in special cases. In conjunction with the compilation of the data bank, new accession lists will be published which will correspond to the present AKN-Hum, AKN-Nat and AKB-Hum/Nat Index series but will list new accessions to all the 200-odd libraries covered by the Accession Catalogue. This expansion will mean that notifications will increase by at least 150 % over the existing rate. A highly restrictive policy is being pursued with regard to books more than, say, five years old and to duplicate notifications. The entire body of literature will be listed only in 5-yearly AKB catalogues which will contain full particulars of where the literature is to be found. Both new accession lists and the AKB are expected to be printed in the improved typography already referred to. The new AKN series will not appear until the spring of 1971 at the earliest, and the first ADP-produced volume of the AKB will possibly cover the 1971-75 period. The data bank will also be able to supply many types of catalogues and special bibliographical lists to order.

So far, the system design is only at the draft stage. A great deal of attention is being paid here to the choice of method of back--checking, i.e. checking to determine whether or not motified titles are already on file in the data bank. As about half the notifications received in any year are duplicates, these must be sorted out to avoid doubling the amount of punching, proofreading and conputer processing necessary. If a notified title has previously been fed into the data bank, all that actually needs to be done is to punch the address and designation of the library and add this information to the bank. The three principal methods available are manual back--checking in a constantly updated card file, mechanical back-checking with short back-checking entries on a magnetic tape which is compared with the data bank (if the latter is arranged in sequence), and direct on-line back-checking and updating (if the data bank is stored in a direct-access memory. The economic pros and cons of the first two methods as compared to each other can be determined only by careful experimentation. The third method calls for more sophisticated techniques and will be the obvious choice in a few years'time. Both the mechanical methods will be radically simplified by the introduction of Standard Book Numbers on the British model as unambiguous addresses for book titles and by the fact that notifications, at least from the larger libraries, will be made out direct in machine-readable form.

The proposed system for ADP production of a Swedish Periodical Register aims at creating a data bank of foreign periodicals stocked by Swedish research libraries, both titles and issues. This bank is to be compiled on the basis of fresh notifications of changes in the stocks held by libraries listed in the Accession Catalogue (new or discontinued subscriptions, changes in titles); all this information will be published in a series of regular bulletins designated AKN--Per. Retroactive transfers of older information will be published at irregular intervals in lists covering longer periods; these lists will be designated AKP. The latter work will be done in collaboration between the AK Editorial Office, which will produce working lists of previously notified periodicals with the help of the computer, and the AK libraries, which will complete the working lists with particulars of issues in stock, etc. The collected data bank till be able to supply all types of catalogue information with titles and particulars of issues in stock in more or less complete

form, systematically and alphabetically sorted, comprising many or few subject groups, and covering shorter or longer periods. Both series are expected to be set by advanced typographic techniques.

Manual editing of notifications must be preceded by checking and sorting routines to distinguish actual new notifications from notifications of changes in stocks, etc. of titles already on file. As the volume of the data bank grows, these back-checking routines will become more and more important, and mechanical routines must therefore be introduced right from the start.

## Administrative savings through production of the Accession Catalogue by ADP

Considerable difficulties are involved in making economic comparisons between manual routines for a given type of work and the corresponding computerised routines. There is normally no complete picture available of the actual costs of either the manual or proposed computerised methods - the latter often spring unpleasant surprises in this respect during the introductory period - and automation often brings with it such extensive changes in the objectives of the field of work in question and in its results that the comparison is made between systems which are not directly comparable. This is very much the case with regard to library work.

Investigations conducted by the Committee and the National Office for Administrative Rationalisation and Economy suggest that the costs of an ADP-produced AKB and production by existing manual methods are so nearly equal that, in view of the many elements of uncertainty such as lack of method studies and lack of information on the costs of advanced computerised typesetting, it is impossible to determine which alternative works out cheapest. At present, the costs aount to Skr. 5.18 per notification to the AKN; with the proposed future system, this figure is expected to drop to Skr. 4.38, partly as a result of improved methods of back-checking. The corresponding cost for the MARC I project was Skr. 8.18. Over a five-year period the ADP system can be expected to save approx. 7½ man-years of work, i.e. 1½ man-years per year. This saving, albeit a useful one in view of the shortage of qualified personnel, is offset by the capital cost of equipment for the ADP system.

The most important gain achieved by a changeover from manual to automated methods of producing the AKB lies in the field of improved service; this will be of tremendous economic significance to the rationalisation of research work and thus indirectly to the community at large. New literature will be listed within a few months of notification, instead of with a time-lag measured in years as is the case with the present AKB; the systematic arrangement will permit active scanning of the literature in a way that is impossible at the present time; and the automated system will permit selective distribution of information to research workers and institutions, an improved nation-wide loan service, and progress towards the direct-accession methods that in a not-too-distant future will herald the definitve breakthrough of the "information society".

## ADP in the research library of the future

The information explosion, generated by the accelerated growth of education, research and demand for information in every field of social endeavour and illustrated by the doubling of the corpus of literature in less than 20 years, the ever more differentiated application of data-bearing media, and the difficulties of coping with and utilising stored information, has been parallelled by the expansion of ADP techniques which offer a means of controlling and recovering all this information. The advance of technology is producing computers capable of working at ever higher speeds with capacious memories and low storage costs, and in a decade or so it will be technically possible to master the flood of information in a way that will be quite revolutionary and indeed hard to conceive from our present-day point of view. The greatest progress in ADP techniques has been made in the field of automated documentation, but ADP systems for catalogue production and other aspects of library work are also currently being planned or already in operation.

The aim of continued ADP development in the Swedish library world should be to set up a joint data processing centre linked to terminals in the major research libraries, which would form the nexuses of a national library network. Catalogue data would be fed in through these terminals to the central data bank, which could thus produce all Accession Catalogue publications as well as individual catalogues in book or card-file form for all subscribing first-tier

and second-tier libraries plus special bibliographical lists of any type required, e.g. for SDI. Conversion of the data bank to direct--access memory will greatly facilitate the actual process of cataloguing; direct dialogue between the cataloguer and the data processing centre via terminal and keyboard-equipped display screen will increase both the speed and accuracy of cataloguing and updating of the national data bank. Even when this is achieved, however, some form of central control of the work will still be necessary.

A system for converting the various products of the Swedish National Biography into machine-readable form will be worked out as soon as circumstances permit. The gains in administrative efficiency resulting from this will be substantial: each title need only be catalogued once, and the national bibliographic data bank can supply all the information needed by libraries, publishing houses and the wholesale and retail book trade. New items from Sweden can be taped once a week for the exchange scheme mentioned below between bibliographical centres in different countries or linguistic areas. It is planned to introduce a system of Swedish Standard Book Numbers to facilitate computer processing of catalogue information concerning Swedish literature.

The efforts towards national and international co-ordination which are making themselves felt to an ever-increasing degree in the fields of bibliography and catalogue compilation will necessitate the adoption of uniform rules for both descriptive and real cataloguing, as well as of compatible systems for automatic data processing. This applies particularly to the construction of the data framework, which is being modelled on the Library of Congress MARC II project. It will be possible in the not-too-distant future, with the help of taped bibliographical information arranged according to the MARC systems and with entries coded by SBN or other foolproof means of identification obtained from the national bibliographical centres of the major linguistic areas, to compile data banks of foreign literature in Sweden from which catalogue data can be extracted without the normal time-consuming process of cataloguing. Sweden must of course also contribute actively to the international pool of machine-readable bibliographical information thus established. Collaboration in this field between the different sectors of the Swedish library world (general and specialised scientific libraries and public libraries) must be further reinforced.

As we have said, the adaptation of ADP aids to library work has proceeded farthest in the areas of catalogue production and bibliography, where the development of national data banks and an international exchange of catalogue information between bibliographical centres are immediate and decisive goals. When these aims have been realised, as they may be during the first half of the seventies, the groundwork will have been laid for total integration between these routines and other library activities. The catalogue entry is the key information unit in all this work. A network of terminals from library regions round about the country to the national data processing centre, which in turn will be in on-line communication with the bibliographical data bank and the central records of purchases, borrowing statistics and population, will make it possible to exercise central control over accessions and borrowings, both regional and national, and thus over national planning of the supply and distribution of foreign literature, which will result in efficient, economical utilisation of the national funds available for these purposes. It will be possible to offer central service facilities in the form of reliable facts on which to base regional purchasing decisions and of checks on printers' deliveries, handling of periodicals and borrowing. The organisation envisaged here, aiming as it does at administrative rationalisation and integration, must of course be built up gradually in a series of stages, the implementation of each stage being preceded by thorough systematic analyses, experiments and consideration of the economic factories involved. In Sweden there appear to be exceptionally good prospects of developing ADP systems for accession and borrowing control that can be integrated with the bibliographical routines.

The bibliographical system, with its comprehensive and flexible data framework modelled on MARC II and its successors in various countries, also opens the way to future integration with newly designed documentation systems; a collected SDI can thus provide both abstracts, bibliographical titles and particulars of location concerning the literature with which these systems are concerned. In a slightly more distant future one can discern a general nation-wide and world-wide information network in which the entire body of human knowledge will be available to everyman by home television, telephone or teletype, with information retrival, news services and education integrated into a single global system.

## Conclusions and recommendations

The work of the Committee has differed from that of a normal study group by virtue of its heavy concentration on the practical aspects of library catalogue work, the present status of which is the main theme of this report. The present report is not the final one; we expect to issue a third report after a planned study trip to Great Britain and West Germany. After that, we propose that the work be reorganised to make effective use of the experience of Committee members during the coming phases of development.

We propose that the present methods, scope and financing of the conventionally edited AKB and the ADP-produced AKN series be retained and changed up to and including the 1970 volumes. Subsequently to these, several lines of development can be pursued:

1, The ADP-produced AKN series can be expanded to cover the entire AK field. A new series, AKN-Per, listing changes in library stocks of periodicals, can be produced during 1971, and the revised AKN series covering literature in book form can also be started in the same year. Collected AKB and AKP catalogues can then be compiled as required. The new systems that will be adopted feature a data framework compatible with that of the MARC systems and magnetic-tape--controlled typesetting that will permit a high standard of typography in the offset-printed catalogues. This production will call for a temporary expansion of personnel during the 1971-73 period, when manual production of the AKB up to and including the 1970 volume will still be going on side by side with the current AKN series. The system will also require a more extensive organisation; investigation and implementation of the requirements in this respect should be put in hand as soon as possible.

2. An organisation equipped to receive and utilise machine-readable catalogue information from the national bibliographical centres of other countries and the MARC data bank compiled from this information must be set up with an expanding capacity to match the availability of such information. Although the only sure source at present is the USA, data of this nature will eventually be available from the United Kingdom and the Federal Republic of Germany as well.

3. The ultimate aim of further development should be total integration of the routines of the Swedish library services in a single system. To

this end a national library data processing centre is proposed, with terminals connecting it to libraries all over the country. By checking with bibliographical data banks, purchasing records, borrowing records and statistical records this centre could keep track of accessions, cataloguings and borrowings of books and periodicals, which would greatly reduce the volume of routine manual work in individual libraries, permit swift and sure scanning and location of wanted literature, and furnish detailed information on existing requirements that could be of immense value to planning our national supply of literature from abroad. Such a system would demand sophisticated on--line methods with advanced terminal equipment and high-capacity direct-access memories. The necessary technology already exists for the most part and is still in process of rapid development, and there are therefore excellent prospects that these methods can soon be applied to library work.

This model, then, implies total and simultaneous integration of all Swedish research libraries,a national model which to date has no counterpart elsewhere. A key feature of the project is the catalogue scheme based on the MARC systems,which ensures the compatibility of the Swedish model with international systems, the development of which must be followed throughout with the closest attention.

4. Simultaneously with the development of data banks for foreign literature and associated integrated ADP techniques, a corresponding system must be developed for the purpose of presenting the products of the Swedish National Bibliography in machine-readable form. The establishment of Swedish Standard Book Numbers and uniform codes for periodicals will play an important part in this effort. Our country must also participate in the international pooling of national machine-readable bibliographical data; these methods, moreover, offer substantial possibilities for administrative rationalisation, especially in connection with the compilation of Central Catalogue products and collaboration between the Swedish research library and public library services.

The establishment and subsequent operation of the automated routines referred to here will demand specialised training of both librarians and computermen at all levels, as knowledge from both fields is essential to the successful development and implementation of computerised routines in the library services. For purposes of method

development, operation of the proposed data processing centre and training of the necessary qualified personnel, the Committee recommends that an independent institution for data processing in libraries bet set up on the West German model.